

MEMORANDUM

A-11176

REFER		NOTED	
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CIIIN - PLS
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FROM:

Herbert A. Tessler, Supervisor, Functional Coordination
Irv Soffer

DATE:

May 13, 1966

SUBJECT:

WTC - TOWERS - EXTERIOR WALL DESIGN

REFERENCE:

COPY TO:

F. Di Paolo, D. Dreiss (JBB), L. Feld, J. Endler (Tishman), I. Gershon (ERS),
M. Levy, E. D. Mills, L. Robertson (WSHJ), A. Schreier (MYA), E. Tuschya (MYA),
C. Pauern, J. Solomon (ERS)

Attached is a chart of "Thermal Conductivity and Heat Transmission" that I prepared from the data supplied to me by Mr. Zeitlin and Mr. Trechsel of the U. S. Steel Co. Applied Research Laboratory in Monroeville, Pa. (Pittsburgh).

The values of the material will vary slightly dependent on the manufacturer. However, the chart clearly indicates the relative range of values, based on the present WTC Tower wall material design.

192-49

Irv Soffer
Irv Soffer

IS:dd
att.

PA LAW DEPARTMENT



58900

J 201-347-1200

1414 FIRST LINCOLN AVE
LINCOLN, N. J.

WORLD TRADE CENTER

" I.C. 412-4104-2265

EXTERIOR WALL, SPANDRELS AND EXTERIOR COLUMN INSULATIONS

N.J. 201-925-2100

THERMAL CONDUCTIVITY AND HEAT TRANSMISSION COEFFICIENTS

Value Based on Wall & Column Design As of 5/5/66

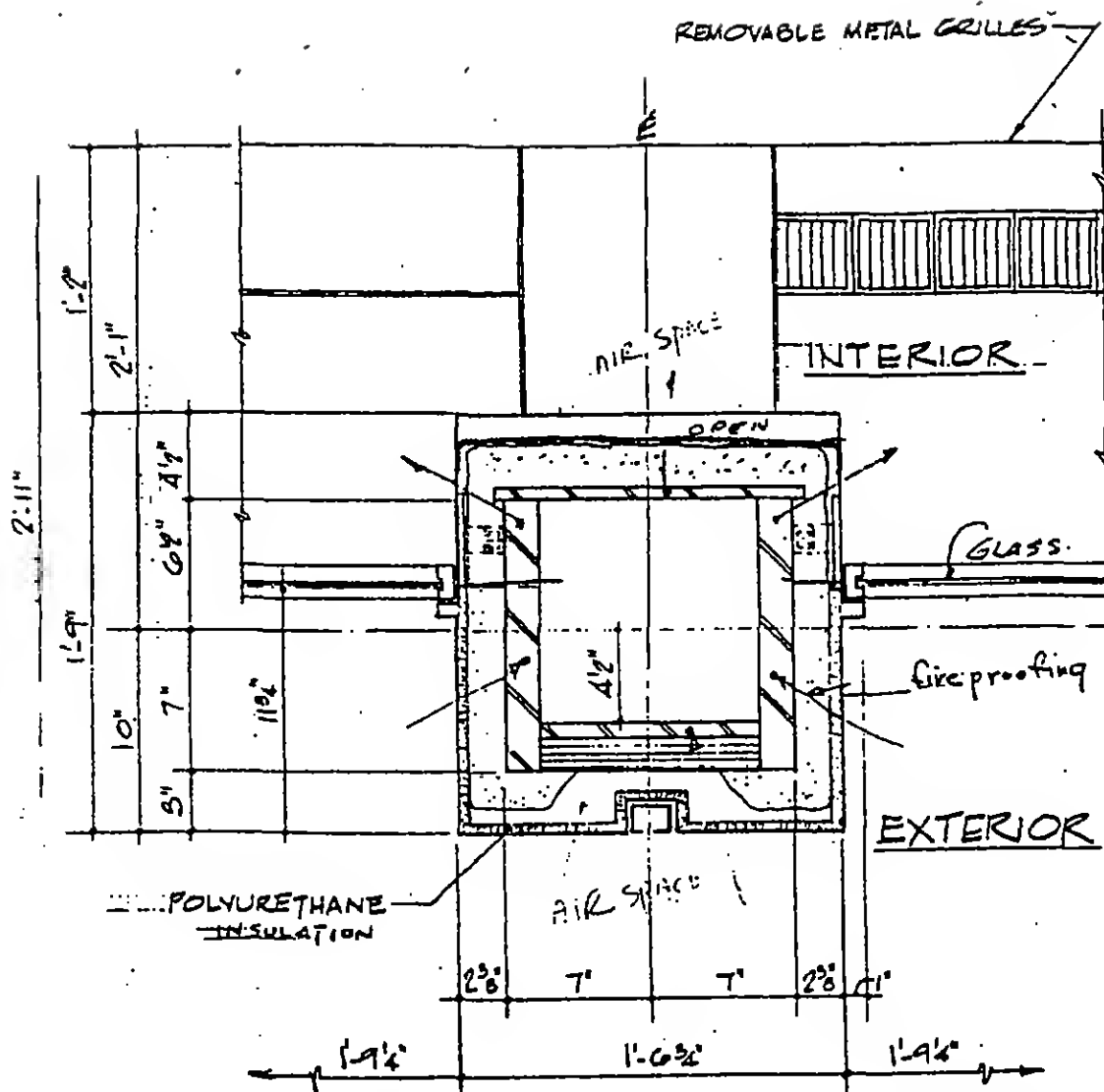
Drawing A-A-314

"U" - Coefficient Transmission - BTU/HR-SF-OF

Notes:

1. Fireproofing for inside face of column is assumed to be 1 3/8" gypsum plaster having conductivity of 1.56 and the overall transmission coeff. of .396 between the room end column steel.
2. Inside still air film resistance is taken as .68
3. Outside air film resistance is taken as .17
4. Air space resistance is taken as .97
5. Conductivity of polyurethane is taken as .17
- NC:rt,dd,fk

NC:rt, dd, fk



EXTERIOR WALL COLUMN

TOWERS A & B

SCALE 1/2" = 1'-0"
 DRAWN BY 3.2.
 APPROVED

THE PORT OF NEW YORK AUTHORITY
 THE WORLD TRADE CENTER

DATE _____ PROJECT NO. _____ DRAWING NO. 61-1A-A-72

Apogee craft,

$$\begin{array}{r} .17 \text{ air film} \\ .97 \text{ air space} \\ \hline 6.25 \end{array}$$

$$7.39 = R \quad u = \frac{1}{R} = .135$$

$$\begin{array}{r} .97 \text{ air space} \\ 6.42 \\ \hline 2.2 \\ \hline 8.62 \end{array}$$

$$u = \frac{1}{8.62} = .116$$

2. 1.14

$$\begin{array}{r} 2.17 \\ \hline \end{array}$$

$$3.31$$

$$u = .302$$

$$= .97$$

$$2.54$$

$$\begin{array}{r} 2.2 \\ \hline \end{array}$$

$$4.54$$

$$u = .221$$

$$3.31$$

$$2.2$$

$$1.5$$

$$6.01$$

3. 1.14

$$\begin{array}{r} 1.56 \\ \hline \end{array}$$

$$2.60$$

$$u = .385$$

$$192.49$$

4. 1.14

$$.45$$

$$1.595$$

$$u = .63$$

$$.97$$

$$.625$$

$$\begin{array}{r} 2.2 \\ \hline \end{array}$$

$$2.825$$

$$u = .353$$

5. 1.14

$$4.27$$

$$5.41$$

$$u = .185$$

$$5.41$$

$$2.2$$

$$.986$$

$$8.396$$

$$9.35$$

$$1.31$$

Fireproofing Material	Conductivity (k) BTU HR-SF- ^R PER-IN.	"U" - Coefficient Transmission - BTU/HR-SF- ^R				
		At Sides of Column		At Outside Face of Column (W/Air Space)		
		With 1 5/8" F.P.	With 3/8" Polyurethane Included	With 1 5/8" F.P.	With 3/8" Polyurethane Included	With 2" F.P. and 3/8" Polyurethane
1. Sprayed Mineral Fiber (Spraycraft)	.26 ^{3.8}	.135 .154	.116 .128	.136	.104	.092
2. Sprayed (Cementitious) Vermiculite (Monokote)	.75 ^{1.33}	.302 .429	.221	.302	.182	.152
3. Laminated Gypsum Board (U. S. G. Fira Code)	1.11 ^{.9}	.305 .595	.267	.385	.209	.195
4. Concrete (L.W. 100 PCF)	3.57 ^{1.28}	.12 1.62	.353	.625	.264	.256
5. Vonco	.38 ^{2.62}	.135 .225	.151	.185	.131	.127
6. Cafco	.27 ^{2.7}	.14 .162	.119	.140	.106	.094

Notes:

1. Fireproofing for inside face of column is assumed to be 1 3/8" gypsum plaster having conductivity of 1.56 and the all transmission coeff. of .396 between the room and column steel.
2. Inside still air film resistance is taken as .68
3. Outside air film resistance is taken as .17
4. Air space resistance is taken as .97
5. Conductivity of polyurethane is taken as .17

NC:rt,dd

MATERIAL	CONDUCTIVITY (k) <small>HR.-SF.-°F.-IN</small>	RESISTANCE (R) <small>HR.-SF.-°F.-IN</small>	"U" - <small>CORRECTION TRANSMISSION - BTU/HR.-SF.-°F</small> Thermal Reduction Value				
	(Resistance) <small>HR.-SF.-°F.-IN</small>	(Conductance) <small>HR.-SF.-°F.-IN</small>	At Sides of Column		At Outside Face of Column (u/Air Sp.)		
			With 1-5/8" F.P.	With 3/8" Polyurethane Incl.	With 1-5/8" F.P.	With 3/8" Polyurethane Incl.	With 2" F.P. and 3/8" Polyurethane
1. Sprayed Mineral Fibre (Spraycraft) or Gafco	0.04 0.26	0.25 3.85	0.25 0.141	0.20 0.107	0.39 0.124	0.16 0.097	0.25 0.026
2. Sprayed (Cementitious) Vermiculite (Nonokote)	0.08 0.35	0.36 1.33	0.35 0.322	0.20 0.192	0.24 0.25	0.20 0.162	0.10 0.138
3. Laminated Gypsum Board (U. S. G. Fire Code)	0.25 1.11	0.98 0.9	0.39 0.133	0.39 0.222	0.40 0.305	0.27 0.175	0.25 0.172
4. Concrete (L.W. 100 PCF)	0.30 3.57	1.00 0.28	1.37 0.767	0.41 0.285	0.50 0.44	0.30 0.224	0.20 0.218
5. Gypsum Plaster	0.50 1.55	0.50 0.64	2.05 0.155	0.31 0.138	0.60 0.166	0.32 0.156	0.31 0.156
6. Polyurethane	0.27	3.7	0.146	0.11	0.128	0.097	0.088
7. Polyurethane	0.17	5.88					

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WTC - EXTERIOR WALL INSULATION

SPANDRELS AND EXTERIOR COLUMNS

THERMAL CONDUCTIVITY AND HEAT TRANSMISSION
(In Order of Max. Thermal Reduction)

VALUES BASED ON WALL & COLUMN DESIGN

As of May 5, 1966

DRAWING A-2-203

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MATERIAL	<i>K</i> (Resist- ivity) "K"	(Conduct- ance) "C"	"U" - Thermal Reduction Value				
			At Sides of Column		At Outside Face of Column (w/Air Spa		
			With 1-5/8" F.P.	With 3/8" Polyurethane Included	With 1-5/8" F.P.	With 3/8" Polyurethane Incl.	With 2" F.P. and 3/8" Polyurethane
Sprayed Mineral Fibre (Spraycraft or Cafco)	0.04	0.24	0.23	0.20	0.19	0.16	0.14
Sprayed (Cementitious) Vermiculite (Monokote)	0.06	0.36	0.34	0.26	0.24	0.20	0.18
Laminated Gypsum Board (U. S. G. Fire Code)	0.15	0.90	0.79	0.39	0.46	0.27	0.25
Concrete (L.W. 100 PCF)	0.30	1.80	1.37	0.41	0.53	0.30	0.29
Gypsum Plaster	0.50	3.00	2.05	0.51	0.60	0.32	0.31

Handwritten: Source of these values and their clear
definition are important.